

Application Serial No. 09/722,400
Attorney Docket No. 100718.124 (MIC-58DV2)
Response to Office Action dated November 12, 2004

REMARKS

I. Introduction

The present Response does not amend, add, or cancel any claims. Accordingly, claims 9-12, 27, 29-40, and 42-50 remain pending in the application.

II. Summary of Rejections

In the Office Action of November 12, 2004, Claims 34, 38, and 46 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,922,623 issued to Tsutsui et al. ("Tsutsui"). Claims 39 and 50 were rejected under 35 U.S.C. §103(a) as being unpatentable over Tsutsui. Claims 9, 11, 27, 29, 31-33, 35, 36, 40, 42, 44, 45, 47, and 48 were rejected under 35 U.S.C. §103(a) as being unpatentable over Tsutsui in view of U.S. Patent No. 5,286,679 issued to Farnworth et al. ("Farnworth"). Claims 9, 10, 12, 27, 30-33, 35, 37, 40, 43-45, 47, and 49 were rejected under 35 U.S.C. §103(a) as being unpatentable over Tsutsui in view of U.S. Patent No. 5,653,619 issued to Cloud et al. ("Cloud"). These rejections are respectfully traversed.

III. Rejections Under 35 U.S.C. §102

Claims 34, 38, and 46 were rejected as being anticipated by Tsutsui. In support of this rejection, the Office Action indicates that Tsutsui teaches a selective vapor phase etching method. The Examiner contends that Tsutsui discloses deposition of a WSi and a gold film, and that these two films function as a mask for etching the silicon oxide layer. The Examiner bases this assertion on the fact that the layer of silicon oxide is later removed. Reference is directed to col. 4, line 50 to col. 5, line 18. The Examiner further contends that the WSi and gold layers are

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masks simply because they are not removed during the etching process. Applicants continue to disagree with these positions.

Independent Claim 34 defines an etch resistant masking layer, comprising:

a layer of material resistant to vapor hydrogen fluoride etchant having an opening within said layer and extending through said layer to expose a portion of an underlying layer such that said portion can be etched by vapor hydrogen fluoride etchant,

said layer of material resistant to vapor hydrogen fluoride etchant being removable after etching.

At least one feature of Independent Claim 34 provides for an opening within the layer. See, for example, reference numerals 215 and 206 in FIGS. 2D and 2E of the instant disclosure. Furthermore, the opening extends through the layer to expose a portion of an underlying layer (204), as clearly illustrated in FIG. 2E. Tsutsui clearly fails to disclose such a structure. The WSi and gold layers identified by the Examiner do not contain any openings through them, as recited in independent claim 34. This is clearly illustrated in FIG. 1B of Tsutsui.

The Examiner further contends that the WSi and gold layers function as a mask for etching a portion of the silicon oxide layer. This assertion appears to contradict what is explicitly stated in the reference. Specifically, Tsutsui indicates that the "silicon oxide film is removed as shown in FIG. 1(c)." There is simply no disclosure or suggestion for etching features in the exposed portion of the layer of silicon oxide. In fact examination of FIG. 1(c) in Tsutsui reveals complete eradication of the silicon oxide layer.

Next, one of ordinary skill in the art simply would not confuse the WSi and gold layers of Tsutsui for a mask structure, particularly in view of the fact that the entire silicon oxide layer beneath them is removed. The Office Action purports to allege that openings exist to the left and right of the WSi/Au structure. These openings, however, do not transform the WSi/Au structure

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into a mask, and they most certainly do not correspond to the claimed openings. Rather, what the Examiner refers to as openings are merely indentations that extend only beneath the sides of WSi and gold structure and not openings within said layer and extending through said layer.

Applicants additionally submit that application of the teachings of Tsutsui would necessarily render the present invention inoperable. Tsutsui discloses complete removal of the silicon oxide layer. The claimed invention defines etching of a feature within a portion of the silicon oxide layer. Complete removal of the silicon oxide layer would thus eliminate the function of the etched feature.

Applicants therefore respectfully submit that Independent Claim 34 is not anticipated by Tsutsui, because Tsutsui simply fails to disclose (or in any way suggest) features recited in Independent Claim 34, such as an etch resistant masking layer "resistant to vapor hydrogen fluoride etchant having an opening within said layer and extending through said layer to expose a portion of an underlying layer such that said portion can be etched by vapor hydrogen fluoride etchant." (Emphasis added).

Claim 38 depends from Independent Claim 34 and is also not anticipated by Tsutsui.

Independent Claim 46 defines an intermediate structure that includes features somewhat similar to those of Independent Claim 34. For example, Independent Claim 46 includes, in part, a masking layer resistant to vapor hydrogen fluoride etchant having an opening within said masking layer and extending through said masking layer.

As previously indicated with respect to Independent Claim 34, such a feature is not disclosed or suggested by Tsutsui. Accordingly, Independent Claim 46 is also clearly not anticipated by Tsutsui.

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The rejections of Claims 34, 38 and 46 as being anticipated by Tsutsui should therefore be withdrawn.

IV. Rejections Under 35 U.S.C. §103

Claims 39 and 50 were rejected under 35 U.S.C. §103(a) as being unpatentable over Tsutsui. These claims depend from Independent Claims 34 and 46, respectively. Accordingly, Claims 39 and 50 are believed allowable for at least the reasons set forth above with respect to independent claims 34 and 46.

Claims 9, 11, 27, 29, 31-33, 35, 36, 40, 42, 44, 45, 47, and 48 were rejected under §103(a) as being unpatentable over Tsutsui in view of Farnworth.

Independent Claim 9 is directed to a mask for selective etching of an underlying layer using vapor hydrogen fluoride etchant. The mask comprises a layer of patterned polyimide, and is removable after said etching.

The Examiner contends that Tsutsui's WSi and gold layers are a mask because these layers are not removed while the underlying layer is etched, and also because they cover the underlying layer. The WSi and gold layers 7, 8 however are not used by Tsutsui as a mask corresponding to the claimed invention because (1) they are not structured to enable any selective etching of the silicon film 6, and (2) they form part of the final structure as a gate electrode and are not removable (or removed) after the etching process. The WSi and gold layer structure permit no selective removal of material. As previously stated, all of the silicon oxide film 6 beneath and around the WSi and gold layer structure is removed because it is not a mask and is not designed to permit any selective material removal.

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Furthermore, Tsutsui is not properly combinable with Farnworth. Tsutsui's WSi and gold structure is not used by Tsutsui as a mask for selective material removal, much less as a photoresist mask. Thus, one skilled in the art would not look to any other reference for any teaching of any particular type of a photosensitive mask to combine with this teaching of Tsutsui.

In addition, Farnworth also does not suggest combination with Tsutsui. Farnworth is directed to a method for attaching a semiconductor die to a leadframe using a patterned adhesive layer. Farnworth teaches in col. 6, lines 50-61 that the adhesive layer could be formulated from photosensitive materials known generally as polyimide siloxanes. A mask is used to form the pattern on the adhesive photosensitive materials. The adhesive layer formulated from polyimide siloxanes is therefore not the mask. Accordingly, one skilled in the art would not consider combining the teachings of Farnworth (which relates to adhesive materials) with that of Tsutsui. The Examiner states that Farnworth was cited for teaching the general step of patterning a polyimide photosensitive layer on a semiconductor wafer through a mask or reticle, and that patterning polyimide photoresist coated semiconductors is common in the art. However, this still does not address the fact that in Farnworth, a mask is used to form the pattern on the adhesive photosensitive materials. The adhesive layer formulated from polyimide siloxanes is not itself a mask, but only made using a mask. Thus, even if Tsutsui's WSi and gold layers arguably form a mask, one skilled in the art would not consider replacing this structure with Farnworth's adhesive materials, which are not a mask.

The Examiner states that "Farnworth teaches that the specific material of a polyimide is commonly known in the art for the application of Tsutsui." However, as stated above, Farnworth teaches that an adhesive layer could be formulated from photosensitive materials known generally as polyimide siloxanes. A mask is used to form the pattern on the adhesive

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photosensitive materials. The adhesive layer formulated from polyimide siloxanes is therefore not the mask.

The Examiner also states that the "references are analogous art as they are both drawn to patterning semiconductor layers using photosensitive and etching processes." Even if correct, the fact that two references are analogous art, by itself, does not provide motivation or suggestion to one skilled in the art to combine the references.

The Examiner fails to present a *prima facie* case of obviousness as set forth by the Federal Circuit and M.P.E.P., both of which require that three basic criteria be met. First, there must be some suggestion or motivation in the primary reference to modify, combine, or seek out the teachings of a secondary reference. Tsutsui discloses a gate structure, while Farnworth discloses patterning of an adhesive layer, neither of which relates to selectively etching as set forth in Independent Claim 9. Second, there must be a realistic expectation of success from combining the two references. Since Tsutsui and Farnworth relate to different endeavors and seek solutions to different problems, there can be no realistic expectation of successfully arriving at the claimed invention. Finally, the prior art references must clearly teach or suggest all the claim limitations. See M.P.E.P. §706.02(j). The Federal Circuit has consistently supported the requirements of the M.P.E.P. in stating, for example, that "[i]n proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a *prima facie* case of obviousness based upon the prior art." In re Fritch, 972 F.2d 1260, 23 USPQ 2d 1780 (Fed. Cir. 1992). There is simply no indication as to why one skilled in the art would be motivated to combine the teachings of these two references.

Therefore, the teachings of Tsutsui and Farnworth are not properly combinable, and the rejection of Independent Claim 9 and its dependent claims should be withdrawn.

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Independent Claim 27 and 40 are similarly allowable over the combination of Tsutsui and Farnworth.

Claims 9, 10, 12, 27, 30-33, 35, 37, 40, 43-45, 47, and 49 were rejected under 35 U.S.C. §103(a) as being unpatentable over Tsutsui in view of Cloud. The Examiner states that while Tsutsui does not teach that the mask comprises non-photosensitive polyimide, Cloud teaches the use of polyimide in an integrated circuit structure. In particular, the Examiner states that Cloud teaches the use of buffer layer 21 for (1) enhancing the strength of a tip 13, and (2) impeding the etching progress into the layer on which the buffering material is deposited.

Applicants respectfully submit that this teaching is not properly combinable with Tsutsui because the WSi and gold layers that the Examiner seeks to replace with the buffer layer are intended to perform neither function, i.e., the WSi and gold layers do not (1) enhance the strength of the structure, nor do they (2) impede the etching progress into the layer on which they are deposited. There is simply no teaching of these functions, or even any recognition of any need for them in Tsutsui. Tsutsui is thus not properly combinable with Cloud because one skilled in the art would have no motivation to combine the references in the manner suggested by the Examiner. These rejections should therefore also be withdrawn.

V. Conclusion

For the reasons stated above, it is respectfully submitted that all of the pending claims (9-12, 27, 29-40, and 42-50) are in condition for allowance. Therefore, a Notice of Allowance is believed in order, and courteously solicited.

The Examiner is respectfully requested to contact the undersigned, if it is believed that such contact would further the examination of the present application.

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AUTHORIZATION

The Commissioner is hereby authorized to charge any additional fees that may be required for this Response, or credit any overpayment, to deposit account number 08-0219.

In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to grant a petition for that extension of which is required to make this response timely, and is hereby authorized to charge any fee for such, to deposit account number 08-0219.

Respectfully Submitted,
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